

**CLAIMS**

What is claimed is:

5        1. A removable tip cap for a syringe, the syringe having a syringe barrel defining a fluid chamber and an elongated tip projecting from a distal end of the syringe barrel, wherein the tip has a narrow passage that extends therethrough and which communicates with the fluid chamber of the syringe barrel, the tip cap comprising:

10        a body having an outer surface, a proximal end, a distal end, and a cavity extending into the body at the proximal end thereof, wherein an inner surface of the body defines the cavity, the inner surface of the cavity having an annular ridge extending into the cavity and defining a contact area to engage the tip of the syringe, wherein the contact area of the annular ridge decreases a surface area of contact between the tip cap and the syringe tip, and wherein the annular ridge creates an annular seal with the syringe tip.

15        2. The removable tip cap of claim 1, wherein the body is a unitary element.  
3. The removable tip cap of claim 1, wherein the body is made as a single component.  
4. The removable tip cap of claim 1, further comprising a plurality of adjacent annular ridges on the inner surface of the tip cap.

20        5. The removable tip cap of claim 1, wherein the cavity has a proximal end and a distal end, and wherein a diameter of the proximal end of the cavity is larger than a diameter of the distal end of the cavity.

6. The removable tip cap of claim 5, wherein the diameter of the distal end of the cavity is larger than a diameter at an end of the syringe tip.

25        7. The removable tip cap of claim 5, wherein the diameter of the proximal end of the cavity is larger than a diameter of the syringe tip adjacent the syringe barrel.

8. A removable tip cap for a luer of a polymeric medical solution container, comprising:  
an integral body having an outer portion and a cavity extending to an inner portion, the cavity having a frustoconical inner surface and an annular ring extending from the inner surface radially toward a centerline of the tip cap.

30        9. The removable tip cap of claim 8, wherein the annular ring has a radius at an edge thereof extending into the cavity, the radius of the annular ring adapted to contact and seal the tip cap against the luer.

10. The removable tip cap of claim 8, further comprising a plurality of annular rings extending radially toward a centerline of the tip cap from the frustoconical inner surface of the cavity.

11. The removable tip cap of claim 8, wherein the cavity has a proximal end, wherein a diameter of the proximal end of the cavity is larger than a diameter of the distal end of the cavity, and wherein the diameter of the distal end of the cavity is larger than a diameter at the end of the luer.

5        12. The removable tip cap of claim 8, wherein the cavity has a proximal end, wherein a diameter of the proximal end of the cavity is larger than a diameter of the distal end of the cavity, and wherein the diameter of the proximal end of the cavity is larger than a diameter of the luer.

13. The removable tip cap of claim 8, wherein the body is integrally formed of a thermoplastic elastomer.

10      14. The removable tip cap of claim 8, wherein the body is integrally formed of rubber component.

15      15. The removable tip cap of claim 8, wherein the body is integrally formed of chlorobutyl rubber component.

16. A removable tip cap for an elongated luer tip projecting from a distal end of a fluid chamber, wherein the luer tip has a narrow passage that extends therethrough and which communicates with the fluid chamber, the tip cap comprising:

an integral body having an outer surface, a proximal end, a distal end, and a cavity extending into the body at the proximal end thereof, wherein an inner surface of the body defines the cavity and has a plurality of adjacent annular ridges extending radially toward a centerline of the body, the annular ridges defining contact areas adapted to engage the luer tip, the contact areas decreasing the area of contact area between the tip cap and the luer tip, and the annular ridges creating annular seals with the luer tip.

17. The removable tip cap of claim 16, wherein the inner surface of the body is frustoconical in shape.

25      18. The removable tip cap of claim 16, wherein a termination of the annular ridges has a radius, the radius adapted to deform against the luer tip to seal the tip cap against the luer tip.

19. The removable tip cap of claim 16, wherein each of the plurality of annular ridges defines an independent seal area with the luer tip.

30      20. The removable tip cap of claim 19, wherein the tip cap has a plurality of independent seal areas.

21. The removable tip cap of claim 16, wherein each of the plurality of annular ridges defines a distinct seal area between the tip cap and the luer tip.

22. The removable tip cap of claim 16, wherein the cavity has a proximal end and a distal end, wherein a diameter of the proximal end of the cavity is larger than a diameter of the distal end of the cavity, and wherein the diameter of the distal end of the cavity is larger than a diameter at the end of the luer tip.
- 5        23. The removable tip cap of claim 16, wherein the cavity has a proximal end and a distal end, wherein a diameter of the proximal end of the cavity is larger than a diameter of the distal end of the cavity, and wherein the diameter of the proximal end of the cavity is larger than a diameter of the luer tip.
- 10      24. A removable tip cap (for a luer of a polymeric medical solution container,) comprising:  
an integral body having an outer portion and a cavity extending adjacent a proximal end  
of the body to an inner portion thereof, the cavity having a frustoconical inner surface and a  
plurality of annular rings extending from the inner surface radially toward a centerline of the tip  
cap, wherein the tip cap is adapted to removably engage the luer of the solution container, and  
wherein the frustoconical inner surface of the tip cap has a surface area less than a surface area  
of the luer.
- 15      25. The removable tip cap of claim 24, wherein the annular rings provide an interference  
fit for securing the tip cap on the luer.
- 20      26. The removable tip cap of claim 24, wherein the annular rings provide for an  
incremental removal force during removal of the tip cap from the luer.
- 25      27. A removable tip cap for a luer of a syringe, comprising:  
an integral body having an outer portion and a cavity extending to an inner portion, the  
cavity having a frustoconical inner surface and a plurality of annular ridges extending into the  
cavity and defining annular contact areas engaging the luer of the syringe, the annular contact  
areas corresponding to annular areas having increased contact pressures, wherein the contact  
pressures at the annular contact areas decreases the contact pressure between the tip cap and the  
luer adjacent the distal portion of the tip cap.
- 30      28. The removable tip cap of claim 27, wherein the annular contact areas result in  
incremental removal forces due to elongation of the tip cap during removal of the tip cap from  
the luer.

29. An syringe assembly comprising:

a syringe having a syringe barrel defining a fluid chamber and an elongated tip projecting from a distal end of the syringe barrel, wherein the tip has a narrow passage that extends therethrough and which communicates with the fluid chamber of the syringe barrel; and,

5 a removable tip cap for the syringe, the tip cap having an integral body having an outer surface, a proximal end, a distal end, and a cavity extending into the body at the proximal end thereof, the cavity having a frustoconical inner surface and at least one annular ridge extending from the inner surface radially toward a centerline of the tip cap, the annular ridge defining a contact area adapted to engage the tip of the syringe, the contact area decreasing a surface area of contact between the tip cap and the tip of the syringe, and the annular ridge providing an annular seal with the tip.

10 30. The syringe assembly of claim 29, wherein the tip cap has a plurality of adjacent annular ridges, each of the annular ridges extending radially toward a centerline of the body, the annular ridges defining contact areas adapted to engage the tip of the syringe, the contact areas decreasing the surface area of contact between the tip cap and the tip of the syringe.

15 31. The syringe assembly of claim 30, wherein each of the plurality of annular ridges defines an independent seal area with the tip of the syringe.

32. The syringe assembly of claim 29, wherein a diameter at the distal end of the cavity is larger than a diameter at an end of the syringe tip.

20 33. The syringe assembly of claim 29, wherein a diameter at the proximal end of the cavity is larger than a diameter of the syringe tip adjacent the syringe barrel.

34. The syringe assembly of claim 29, wherein the annular ring has a radius at an edge thereof extending into the cavity, the radius of the annular ring adapted to contact and seal the tip cap against the tip of the syringe.